

■ Research Highlights

A toxic environment: Life in the seas affected by high-tech industries

The manufacture of thin film transistor liquid crystal displays (TFT-LCDs), used for television screens, computer monitors and mobile phone screens, has increased dramatically over the past twenty years. The volume of toxic chemical compounds discharged into the environment from TFT-LCD manufacturing has also risen significantly, but little is known about the impact of this pollution on living organisms.

Now, Izumi C. Mori and colleagues at Okayama University, together with scientists across Japan and Malaysia, have demonstrated the toxic effect of these chemicals on four aquatic organisms – the fish *O. latipes*, the micro-crustacean *D. magna*, the alga *P. subcapitata*, and the bacterium *V. fischeri*. Micro-crustaceans appear to be especially susceptible to toxicity – this could lead to a significant imbalance in the ecosystem as they have a predatory role.

The team investigated the effects of three main chemicals used in the process of making TFT-LCDs: solvents called tetramethylammonium hydroxide (TMAH), known to cause heart disease and respiratory failure in animals, iodine / potassium iodide solution (KI), and dimethyl sulfoxide (DMSO). The combined toxicity of these chemicals is unknown.

Mori and his team found that the micro-crustaceans were highly affected by the toxins, particularly TMAH. Both TMAH and KI are regularly produced by the same factories and released into the same water bodies. The researchers believe the combined toxicity of both chemicals would cause a three-fold increase in toxicity in micro-crustaceans. With TMAH and KI both highly water-soluble, the team also urge immediate research into the effect of combined chemicals on planktonic species.



The large-scale manufacture of LCD screens could have a significant toxic effect on aquatic organisms, state scientists at Okayama University. The combined toxicity of chemicals deposited in the environment during production severely affects micro-crustaceans – the effects on other organisms are yet to be determined.

Publication and Affiliation

Izumi C. Mori^a, Carlos R. Arias-Barreiro^a, Apostolos Koutsaftis^a, Atsushi Ogo^a, Tomonori Kawano^b, Kazuharu Yoshizuka^b, Salmaan H. Inayat-Hussain^c, & Isao Aoyama^a. Toxicity of tetramethylammonium hydroxide to aquatic organisms and its synergistic action with potassium iodide. *Chemosphere* **120** 299-304 (2014)

a. Institute of Plant Science and Resources, Okayama University, Kurashiki 710-0046, Japan

b. School of International Environmental Science, The University of Kitakyushu, Kitakyushu 808-0135, Japan

c. Faculty of Health Sciences, Kebangsaan Malaysia University, Kuala Lumpur, Malaysia

*corresponding author, e-mail address: imori@okayama-u.ac.jp

- Authors: Mori Izumi C, Arias-Barreiro Carlos R, Koutsaftis Apostolos, Ogo Atsushi, Kawano Tomonori, Yoshizuka Kazuharu, Inayat-Hussain Salmaan H, and Aoyama Isao
 - Title of original paper: Toxicity of tetramethylammonium hydroxide to aquatic organisms and its synergistic action with potassium iodide
 - Journal, volume, pages and year: *Chemosphere* 120, 299-304 (2014).
- <http://ousar.lib.okayama-u.ac.jp/metadata/52905>